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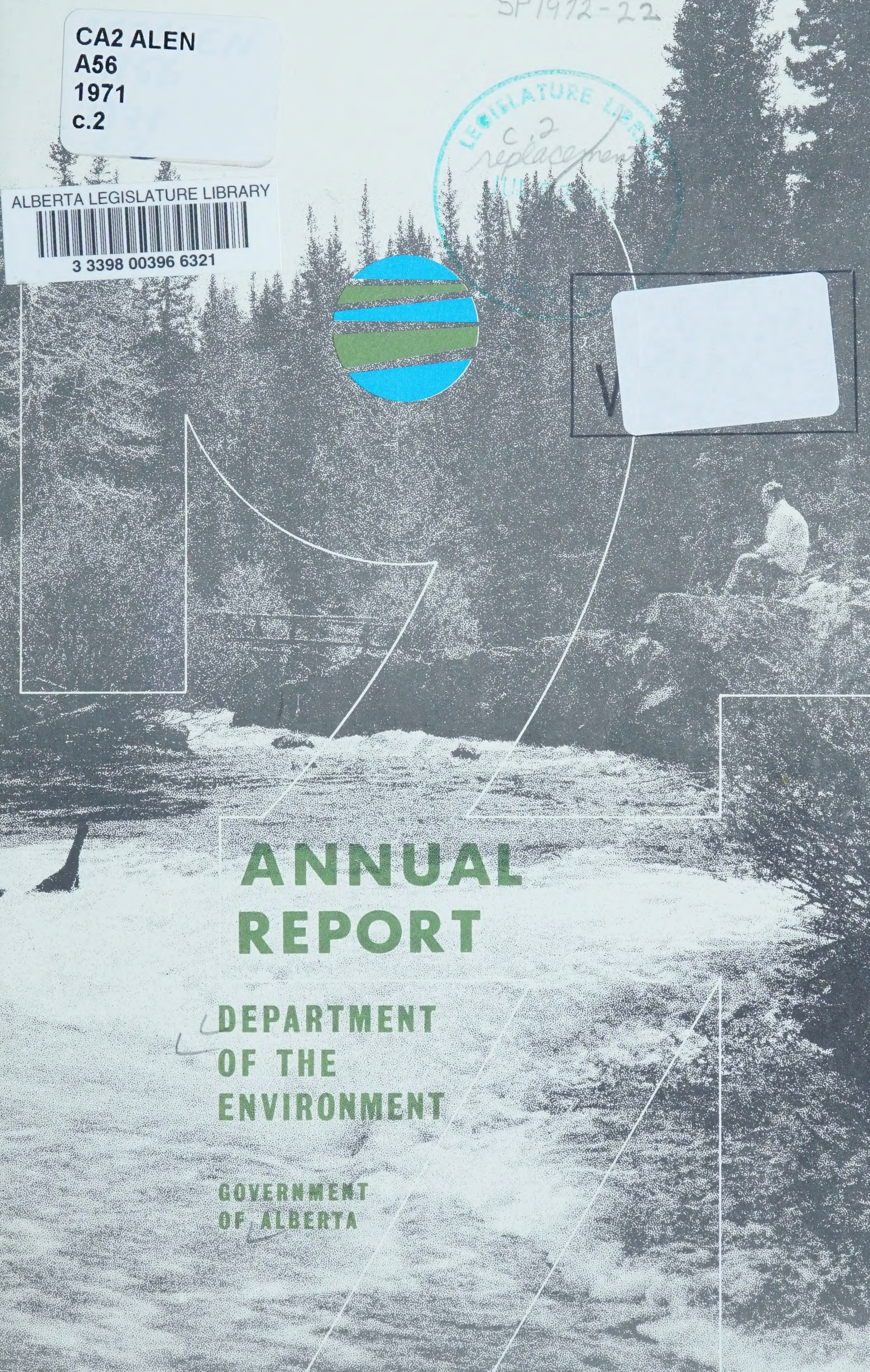

ANNUAL REPORT

DEPARTMENT OF THE ENVIRONMENT

GOVERNMENT
OF ALBERTA

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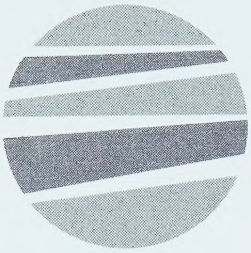

DEPARTMENT OF THE ENVIRONMENT

ANNUAL REPORT

1971

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REPORT OF THE DEPARTMENT OF THE ENVIRONMENT

1971

THE HONORABLE W. J. YURKO, P. ENG.,
MINISTER OF THE ENVIRONMENT.

The Alberta Department of the Environment became a legal entity on April 1, 1971, the date on which The Department of the Environment Act, as passed by the 1971 Legislature as Bill 32, came into force. To the best of our knowledge, it was the first Department of the Environment in Canada and therefore it is an honor to submit to you its first annual report.

The historical background of the department has been recorded with the Provincial Archivist. However, the key operational principles of the department were stated, in brief, as follows:

Firstly, the basic objective of the department was documented as working to conserve and improve the environment in order that Albertans in five, 50 or 500 years will have the priviledge of enjoying a province equal to or better than in 1971.

Secondly, the emphasis was stated to be on prevention of degradation or pollution.

Thirdly, to aid in achieving this, the department was made responsible for the co-ordination of the policies, programs and services of and administrative procedures of departments of the government and of government agencies in matters pertaining to the environment.

Detailed information on divisional activities forms the main body of the department report in the following pages. Some of the reporting will be partial due to operational periods being less than a year during this embryonic stage. However, the Water Resources and Pollution Control Divisions include the January 1 to March 31 period when they were in the Departments of Agriculture and Health, respectively.

During my absence on sick leave from late March to June, Dr. V. A. Wood, Deputy Minister, Department of Lands and Forests, acted on my behalf in getting this department operational. His service is hereby sincerely acknowledged.

All divisions became operational except the Research Division, which will be activated in 1972. Some preparatory work was undertaken but a priority had to be given to other divisions.

A critical analysis was made of the department's capability to carry out its responsibilities. One of the main functional decisions culminated in cabinet approval in October of the establishment of a Standards and Approvals Division in addition to the Pollution Control Division. This separated the approval function from the enforcement function which was recognized as a logical and sound procedure.

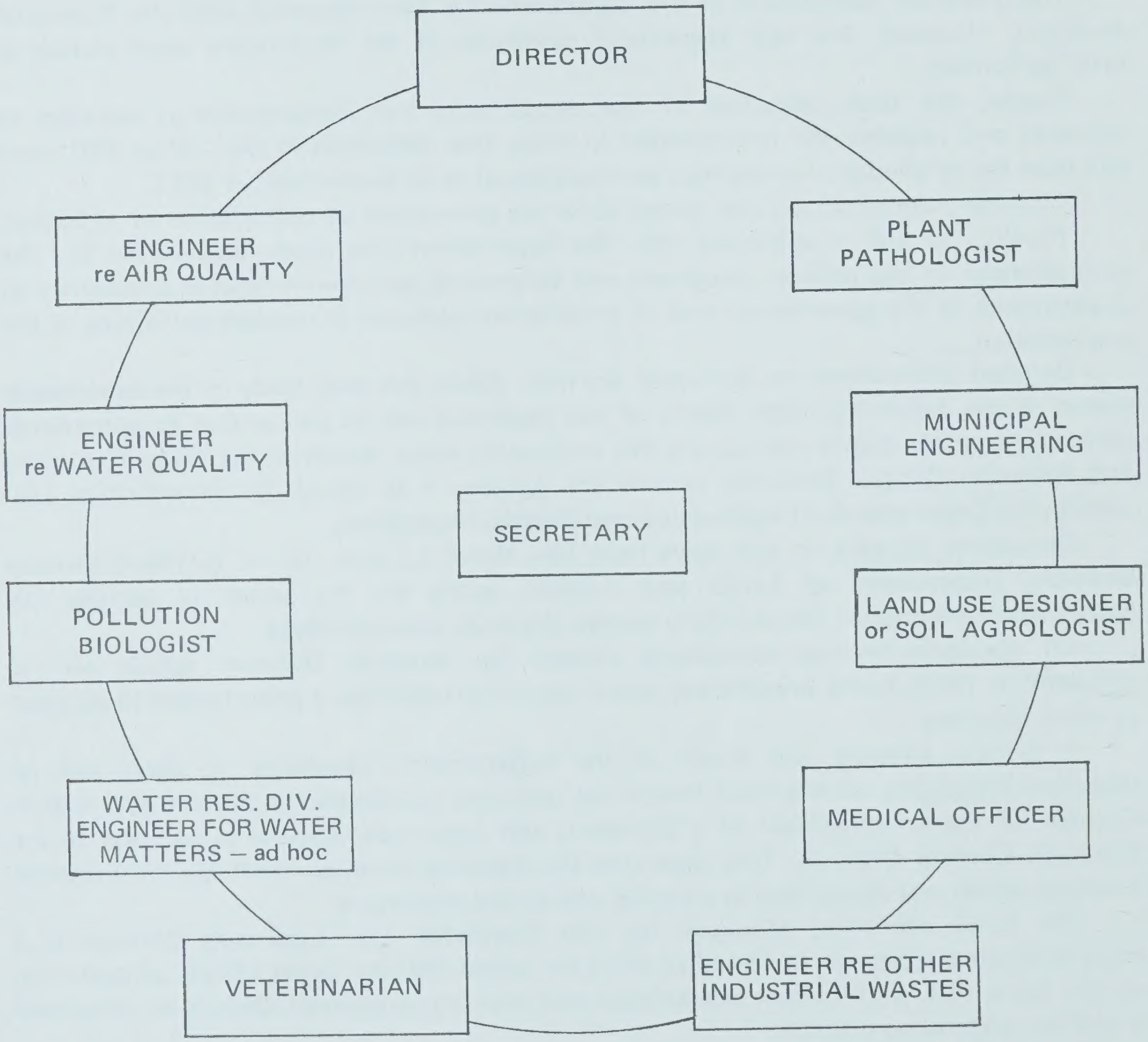
The basic operating principle for the Standards and Approvals Division is a multi-discipline approach (a Canadian first) by which the end point effects of pollution on the flora, soil, widlife, domestic animals and man are considered. Details are presented in the accompanying diagram.

Another decision was to strengthen the laboratory service and the investigation and enforcement capability of the Division of Pollution Control.

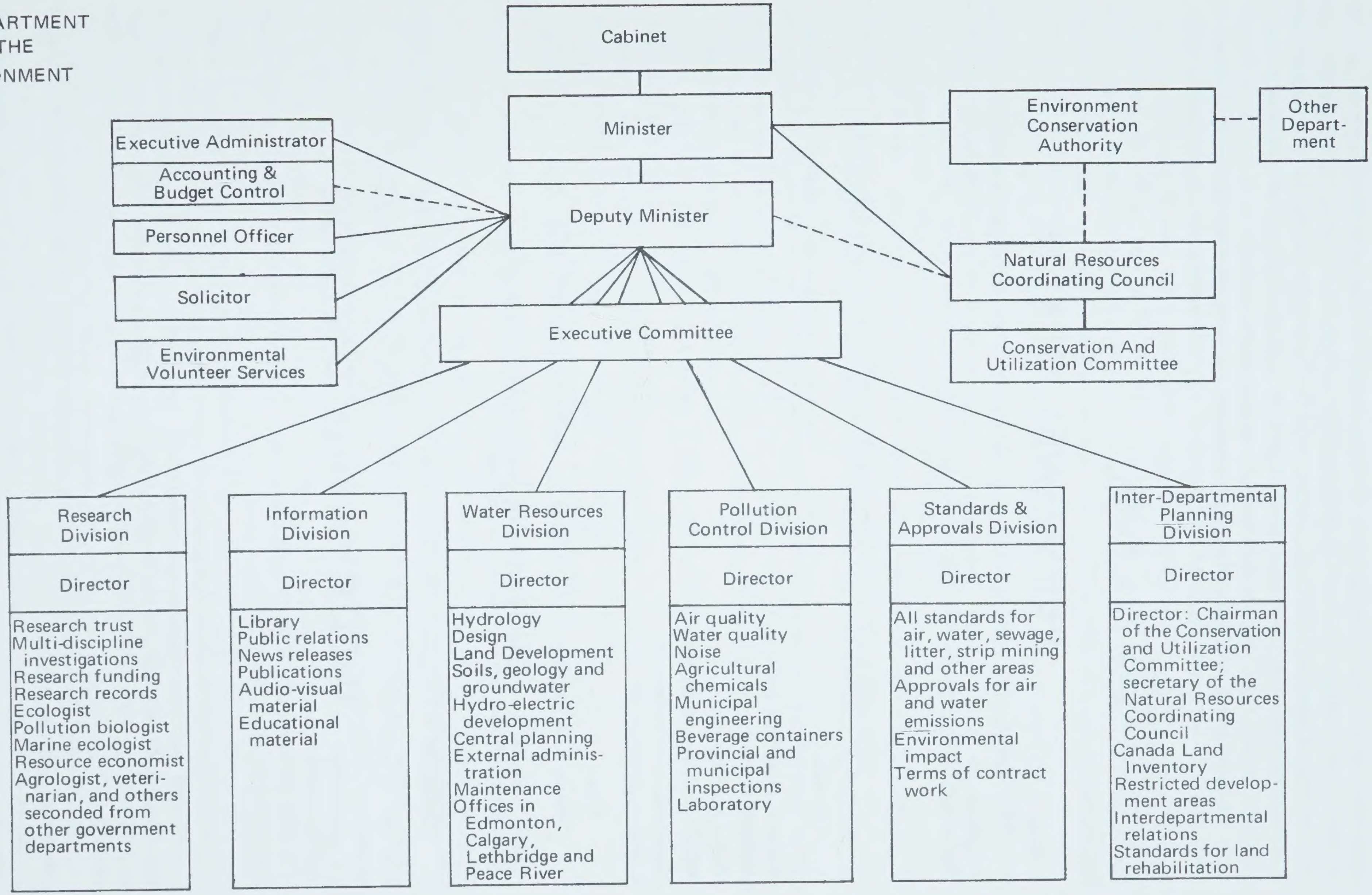
The acts administered by the Department are:

- The Department of the Environment Act
- The Clean Air Act
- The Clean Water Act
- The Alberta Environmental Research Trust Act
- The Water Resources Act
- The Groundwater Control Act
- The Agricultural Chemicals Act (transferred from the Department of Agriculture)
- The Beverage Container Act (transferred from the Department of Highways and Transport)

STANDARDS AND APPROVALS DIVISION


DIRECTOR
PLANT PATHOLOGIST
MUNICIPAL ENGINEERING
LAND USE DESIGNER or SOIL AGROLOGIST
MEDICAL OFFICER
ENGINEER RE OTHER INDUSTRIAL WASTES
VETERINARIAN
WATER RES. DIV. ENGINEER FOR WATER MATTERS – ad hoc
POLLUTION BIOLOGIST
ENGINEER re WATER QUALITY
ENGINEER re AIR QUALITY
SECRETARY

THE DEPARTMENT OF THE ENVIRONMENT


Cabinet
Minister
Deputy Minister
Executive Committee
Executive Administrator
Accounting & Budget Control
Personnel Officer
Solicitor
Environmental Volunteer Services
Environment Conservation Authority
Other Depart-ment
Natural Resources Coordinating Council
Conservation And Utilization Committee
Research Division
Director
Research trust
Multi-discipline investigations
Research funding
Research records
Ecologist
Pollution biologist
Marine ecologist
Resource economist
Agrologist, veterinarian, and others seconded from other government departments
Information Division
Director
Library
Public relations
News releases
Publications
Audio-visual material
Educational material
Water Resources Division
Director
Hydrology
Design
Land Development
Soils, geology and groundwater
Hydro-electric development
Central planning
External administration
Maintenance Offices in Edmonton, Calgary, Lethbridge and Peace River
Pollution Control Division
Director
Air quality
Water quality
Noise
Agricultural chemicals
Municipal engineering
Beverage containers
Provincial and municipal inspections
Laboratory
Standards & Approvals Division
Director
All standards for air, water, sewage, litter, strip mining and other areas
Approvals for air and water emissions
Environmental impact
Terms of contract work
Inter-Departmental Planning Division
Director
Director: Chairman of the Conservation and Utilization Committee; secretary of the Natural Resources Coordinating Council
Canada Land Inventory
Restricted development areas
Interdepartmental relations
Standards for land rehabilitation

Close co-operation and co-ordination was maintained with other resource departments and agencies by the Natural Resources Co-ordinating Council and the Conservation and Utilization Committee which are made up of interdepartmental administrative and technical staff, respectively; the former being deputy ministers and the latter being key technical specialists. This was in keeping with one of the basic concepts in designing the department whereby duplication can be avoided.

Your guidance and counsel was of particular value in developing the department to this point in time and on behalf of the staff I hereby record our sincere appreciation.

Respectfully submitted,
E. E. Ballantyne, D.V.M., P.Ag., F.R.S.H.

PERSONNEL OFFICE

The Department commenced operations with a total of 335 permanent salaried positions on April 1, 1971. There was an overall increase of 20 permanent positions to December 31, 1971, giving a year end total of 355.

DISTRIBUTION OF PERMANENT POSITIONS, DECEMBER 1971

Divisions	Clerical	Technical	Professional	Others*	Total
General Administration	16	0	7	0	23
Information	2	0	2	1	5
Pollution Control	8	31	16	1	56
Interdepartmental Planning	2	0	3	0	5
Standards and Approvals	2	0	4	0	6
Water Resources	48	114	79	19	260
Total	78	145	111	21	355
Percent of Total	(22%)	(41%)	(31%)	(6%)	(100%)

*Others includes automotive equipment operators, mobile drill operators, automotive mechanics, information officer, property agents and appraisers, etc.

Additional information and statistics on the overall personnel function in the Alberta Public Service is available in the Annual Report of the Public Service Commissioner.

INFORMATION DIVISION

The Information Division did not become fully operational until the director was appointed on December 1, 1971.

The audio-visual unit of the Human Resources Development Authority was seconded to the Information Division in December to use in the Man and Resources program.

Several private associations conducting information and educational programs approached the department for financial support. A means of providing support to such organizations, rather than adding extensively to division staff, was explored by the director.

An information officer has worked with the divisions which amalgamated to form the department on April 1.

Since February 1, the following have comprised the major activities of the information personnel:

Public Information: Numerous requests for information relating to the environment were received, mainly from students in Alberta schools. Many of these received a personal reply to answer specific questions. Telephone inquiries were also answered, although not encouraged. To provide more comprehensive information for the public, an information kit was initiated, which, at year end, was in the production stage. This kit outlines pollution and environmental problems in Alberta, as well as information on the work of the department in these fields. Also included are brochures and booklets obtained from other sources, such as the Canadian Wildlife Service, the Soil Conservation Society of America, Alberta Institute of Agrologists, the Alberta Wildlife Foundation, and the Alberta Tuberculosis and Respiratory Disease Association. Requests to provide speakers were also received and met.

Environment News: This newsletter was first published in April, and has been distributed monthly since June. It contains news items from Alberta and elsewhere pertaining to pollution control and resource management, and has been very favourably received, especially by educational institutions. As of December 31, a total circulation approached 3,000 copies.

The circulation list includes all schools, public libraries, news media and interested groups and individuals. Environment News contains 12 to 16 pages, and is distributed free of charge on request.

News Releases: News releases on activities of the department were distributed to all Alberta media, and specific information gathered on request.

Advertising: Advertising for the department was placed, through the facilities of the Publicity Bureau, Alberta Department of Industry and Tourism.

Reports: Assistance was provided to divisions in the design, publishing and distribution of reports.

Library: The library of the Department of the Environment was formed by the amalgamation of the Water Resources library (Department of Agriculture), with the book resources of Environmental Health Services (Department of Health) and Conservation and Utilization (Department of Agriculture).

At year end, the library contained 2,050 volumes. Of this number, approximately 800 were out on loan.

The two months that the library was operational in 1971 were spent mainly in sorting literature and placing orders for new equipment and books.

INTERDEPARTMENTAL PLANNING DIVISION

The general objective of the Interdepartmental Planning Division is to ensure the development and integration of environmental objectives in all provincial government actions.

Specific objectives are interdependent and complimentary, and can be stated as follows: to monitor all government departments to obtain submissions, views, and general reactions to active or suggested government policies, programs, actions, regulations and proposed legislation regarding environmental matters; to serve as a major linkage between the Department of the Environment and other departments and agencies of the provincial government; to serve as the administrative secretariat to the Conservation and Utilization Committee and the Natural Resources Coordinating Council; to provide integrative capability within the Department of the Environment; to support activities directed toward the formulation of long range environmental plans, the definition of objectives and priorities, and the monitoring and coordinating of ongoing programs and projects; to serve as a point of contact within the Department of the Environment for external organizations, such as municipalities, industries, and various associations; and to facilitate the coordination of integrated land use planning activities within the province.

Through its Interdepartmental Planning Division, the Department of the Environment played a key role in the coordination of the environment related policies, programs, services and administrative procedures of government departments and agencies.

The division acted as the secretariat to two coordinating interdepartmental committees: the Natural Resources Coordinating Council consisting of deputy ministers of environment-related government departments; and an operating counterpart to the council at the directors' level, the Conservation and Utilization Committee.

The C and U Committee consisted of resource managers representing a number of areas, including earth sciences, law, water resources, pollution control, industrial health, highway planning, lands, fish and wildlife, forestry, parks, minerals, municipal affairs, and energy development.

These two committees, with the support of the Interdepartmental Planning Division, inquired into matters pertaining to the environment and reviewed the environment related policies, program, services and administrative procedures of government departments and agencies. The division director was both chairman of the Conservation and Utilization Committee and secretary to the Natural Resources Coordinating Council and provided a direct linkage between the two committees. Thus, operating primarily through the Interdepartmental Planning Division, the Department of the Environment played a key role in the day-to-day coordination of the interdepartmental activities associated with the preparation of environment related studies and recommendations for the consideration of the Minister of the Environment and the government.

The Conservation and Utilization Committee made its reports and recommendations to the Natural Resources Coordinating Council, which in turn made its reports and recommendations to the Minister of the Environment.

The multiple-discipline, multiple-agency representation on these two coordinating committees provided for and ensured balanced study and coordinated government action in connection with environmental matters. The Coordinating Council and its operating counterpart, the Conservation and Utilization Committee, constituted the prime administrative mechanism through which interdepartmentally-derived recommendations on environmental matters reached the Minister of the Environment.

On the other hand, the Environment Conservation Authority, through its public advisory committee and through public hearings, constituted the prime mechanism through which recommendations derived through public participation reached the Minister of the Environment.

CONSERVATION AND UTILIZATION COMMITTEE

Task forces were set up for the purpose of investigating specific subjects of concern with a view toward reporting recommended alternative courses of action. They were problem oriented, short term working groups constituted to ensure that the professional expertise available in various government departments and agencies was integrated into a multidisciplinary consideration of the problem.

Task Force on Surface Disturbance and Reclamation. This task force was constituted under the auspices of the Conservation and Utilization Committee for the purpose of developing regulations for the prevention and control of environmentally degrading surface disturbances. The task force examined and will continue to look at four areas of concern: (1) well drilling such as oil, gas, water and deep disposal wells; (2) excavations of varying scale including clay and marl, sand and gravel as well as sanitary land fill; (3) operations with linear characteristics such as geophysical operations, pipelines, utility rights-of-way, resource access roads, etc; and (4) water reservoir and flood area reclamation. Surface disturbance and its application to coal mining had already been studied in depth by the committee and findings will be incorporated in subsequent legislation.

Task Force on Wabamun Lake. The government instructed the Conservation and Utilization Committee to coordinate various studies and research projects on Wabamun Lake in order that an integrated long term developmental plan for the general area be formulated. Subsequently, a Conservation and Utilization Committee Task Force submitted an interim progress report to the Conservation and Utilization Committee which contained land use recommendations for the Wabamun Lake watershed. The recommendations dealt only with the amelioration of immediate problems and the guidance required to develop long term plans for the area.

Tree Removal and Stream Bank Protection Task Force. The terms of reference for the task force were broadly as follows: (I) obtain a broader interpretation and application of the land conservation rules; (2) examine existing regulation to determine their effectiveness and any need for change or updating; and (3) investigate the need for enforcement, programs, zone adjustments, coordination, and the service to the public that would encourage positive attitudes and action. The task force report recognized that the long term solution to adequate stream bank protection is through comprehensive land use planning. The task force recommendations stressed that government policy should support and encourage regional planning activities.

Rights-Of-Way and Pipeline Corridor Task Force. The Provincial Planning Board joined with the Conservation and Utilization Committee to investigate all aspects and problems of rights-of-way, both above, on and under the ground, including power transmissions, oil and gas and solid pipelines, private roadways, irrigation ditches and canals and utility corridors.

Brazeau Dam Task Force. At the request of the Minister of the Environment, the Conservation and Utilization Committee established a task force to compile information about the current situation surrounding the Brazeau Dam and recommend any future action to reduce any pollution hazard, develop recreational potential, and restore environmental aesthetics.

Task Force on Criteria for Purchase of Tax Recovery Lands. The Conservation and Utilization Committee established a task force to review, report and make recommendations on criteria for the purchase of tax recovery lands in municipal districts and counties. The Conservation and Utilization Committee approved in principle the recommendations of the task force for the revesting of tax recovery lands throughout Alberta in accordance with a system of priorities for purchase and/or management.

In addition to the above task force activities, the coordinating efforts of the Conservation and Utilization Committee and the Interdepartmental Planning Division were associated with a wide range of environment related government activities including such areas of concern as the sponsorship through the Canada Land Inventory Program of the Foothills Resource Allocation Study which is coordinated by the Alberta Forest Service, and the development of Alberta's contribution to the Canadian Council of Resource and Environment Ministers 1973 Conference.

Other topics discussed by the Conservation and Utilization Committee include community pastures, grazing reserves, land conservation guidelines, and rural development; land acquisition for resource conservation; the use of remote sensing data for integrated resource management; the recommendation of the establishment of a total resource management data system; the coordination and integration of land use planning at the provincial, regional, and municipal levels; and the mineral sales review referral system. Specific developments discussed included the Bighorn Dam, the Proctor and Gamble pulp mill at Grande Prairie, Imperial Oil's pilot project for the termal extraction of oil at Cold Lake, the Canmore strip mine, the controlled oil spill on the Pembina River and others.

PROGRAMS

In addition to providing secretarial support for the Natural Resources and Coordinating Council and the Conservation and Utilization Committee, the Interdepartmental Planning Division also provided administrative capabilities for programs that are interdepartmental in nature: specifically, the division administered the Land Assembly Program, and the Canada Land Inventory Program.

Land Assembly Program. The accompanying table shows land purchased for alternate land use and resource adjustment. Various departments requested the purchase of lands for government projects, such as provincial parks, reservoirs and dams, reforestation, grazing reserves, and others.

LAND ASSEMBLY

Purpose of Purchase	No. of Parcels	Cost
Grazing reserve assembly	24	$109,634.00
Forestry assembly	5	5,337.42
Watershed conservation	39	156,742.50
Community pasture assembly	––	––
Recreation assembly	10	48,232.00
Wildlife conservation	4	14,908.21
Conservation assembly	237	443,450.00
Total	309	$778,304.14

Canada Land Inventory Program. The objective of this program was to map the resource potential of the settled parts of the province. It has been federally financed since 1963, and operated by Alberta's natural resource agencies at a cost of $150,000 in 1971 for over $985,355 to date.

During the year, 34 large scale, film positive maps were completed and made available for provincial use and computer input.

The multiple comparison of large scale maps for all capabilities was made possible for most regions. The maps were being used in administration, planning and research of renewable resources by provincial and municipal agencies, notably in the Foothills, the Peers-Whitecourt, and the Hinton-Yellowhead Land Use Studies and by the Land Use Assignment Section to define the green-yellow line. Maps were being received by 140 offices, including libraries.

Difficulties with maps were being investigated to improve computer handling of the information in the Canada Geographic Information System which is designed as a land data storage and analysis service to governments.

DIRECTOR'S AND DIVISION'S ACTIVITY

In addition to the provincial interdepartmental activities cited above, the director and division staff were active in the following areas.

Environment Conservation Authority. This division is the prime link between the Authority and the related technical agencies of the government. Subject matters included the public hearings on Cooking Lake, the public hearings on surface mining, and the organization of a Public Advisory Committee.

Advisory Committee on Wilderness Areas. The director, as secretary member of the committee, assisted in the formulation of recommendations to the Lieutenant Governor in Council on the three provisional wilderness areas: Siffleur, White Goat and the Ghost River.

Agricultural and Rural Development Act (ARDA). The director was a member of the federal-provincial committee planning and negotiating on behalf of the province. The 1970-75 agreement was signed between the Alberta government and the federal Department of Regional Economic Expansion.

Canada Land Inventory Agreement. The director and staff continued negotiations with the federal Department of the Environment to expand the inventory area into the northern parts of Alberta.

Special Areas Joint Planning Committee. The director was a member of the Joint Planning Committee planning and negotiating project agreements for the Slave Lake Special Area. A program agreement was signed with the federal Department of Regional Economic Expansion during 1971.

Canadian Advisory Committee on Remote Sensing. The director was Alberta's representative on this national body. Progress in coordinating Alberta's activities and relating them to the National Remote Sensing Program as well as the National

Aeronautics and Space Administration Program on Earch Resources Technology Satellite was favorable. The committee was under the auspices of the federal Department of Energy, Mines and Resources.

Canadian Council of Resource and Environment Ministers. The director was Alberta's alternate member on the Man and Resources Management Steering Committee. Progress on the program culminating in the 1973 conference was favorable.

OTHER DIVISIONAL ACTIVITY

In addition to the various coordinating and program activities this division compiled working inventories of environmental legislation and programs in preparation for legislative and program reviews and to define the roles of government agencies.

POLLUTION CONTROL DIVISION

The Pollution Control Division had the responsibility of monitoring and enforcing the provisions of The Clean Air Act, The Clean Water Act, The Agricultural Chemicals Act, and The Beverage Container Act.

The basic framework and direction for overall operation of the division was delineated by passage of The Clean Air and The Clean Water Acts. The Beverage Container Act was passed in April with pertinent regulations adopted by an Order-in-Council in November. The administration of The Agricultural Chemicals Act was transferred from the Department of Agriculture to the Department of the Environment in November and the Pollution Control Division was further reorganized to provide emphasis on the enforcement powers embodied under these Acts.

AIR POLLUTION CONTROL BRANCH

Monitoring of Alberta air in the urban and rural areas continued to be a major concern of the Air Pollution Control Branch. The air quality assessment program was supplemented by complaints from a more aware public. These complaints and subsequent investigations led to direct remedial control action, confirmation of problems, or further monitoring to explore problem areas in greater depth.

The Air Pollution Control Branch monitoring network consisted of 25 continuous pollutant analyzers monitoring eight different pollutants; 13 intermittent type monitors monitoring suspended particulates (hi-volume sampler) and 477 static type monitors for the detection of total sulfation, hydrogen sulphide and total dustfall. As an indication of public concern, 185 complaints were received in 1971. This represented a slight increase from the previous year.

The rural monitoring program remained relatively unchanged in 1971 with 34 surveys conducted in 27 areas. The number of vegetation samples taken in 1971 increased substantially to 252.

Air Quality Monitoring

In order to assess the quality of air and establish control program priorities, a monitoring network as outlined in the accompanying table was maintained in Alberta. In the rural areas of the province it was generally one specific industry that gave rise to pollutant emissions. The monitoring program in the rural areas was designed to supplement the primary monitoring carried out by the specific industry and to check the accuracy and effectiveness of the industry's monitoring program.

Since by far the majority of the population was concentrated in the urban areas and since many varied industries were active in the urban areas, it was here that the continuous monitoring program of the Air Pollution Control Branch was emphasized. The monitoring and plant operating data submitted on a monthly basis was reviewed and high readings were followed up for remedial action through the Energy Resources

AIR QUALITY MONITORING 1971

	CONTINUOUS MONITORS IN OPERATION						INTERMITTENT EXPOSURE CYLINDERS			
	Suspended Particulates (Soiling Index)	Total Oxides of Nitrogen	Nitrogen Dioxide	Total Oxidants	Total Hydro-carbons	Carbon Mon-oxide	Suspended Particu-lates (Hi-Volume Sampler)	Total Sulfa-tion	Hydrogen Sulfide	Total Dustfall
Edmonton	6	1	1	1	1	1	3	12	12	12
Calgary	5	1	1	1	1^a	1^a	4	12	12	12
Urban Trailer	1^b	1^a	1^a	1^b		1^a				
Red Deer							1			
Lethbridge							1	2	2	2
Medicine Hat							1			
Grande Prairie							1	1	1	1
Camrose							1	1	1	1
Hinton							1			
St. Albert							1			
Sherwood Park								1	1	1
Rural Areas	(2 mobile laboratories[c] with one each continuous SO_2 and H_2S analyzer, barometric pressure, relative humidity and temperature, wind speed and direction)							156	156	25
									(d)	

(a) Equipment on order

(b) Equipment under initial test

(c) Similar continuous monitors are owned or leased and operated by private industry for 12 months per year at 12 plants throughout the province and reported to the Air Pollution Control Branch.

(d) An exposure cylinder network of 740 total sulfation and 740 hydrogen sulfide, and 21 total dustfall exposure cylinders is maintained by 64 plants throughout the province and reported to the Air Pollution Control Branch.

Conservation Board or this office. The 1971 rural and urban air quality monitoring programs are summarized as follows:

Urban Air Quality Monitoring Program. The continuous monitoring program in Edmonton and Calgary was for the most part conducted at one station. This was essentially dictated by the limited number of monitors, the high frequency of observation and maintenance servicing required and the limited technical staff available.

The acquisition of proper workshop facilities in 1971 assisted considerably in the servicing of instruments. To obtain continuous air monitoring data and to make the data more credible, a preventative maintenance and intense calibration program was initiated late in 1971.

Rural Air Quality Monitoring Program. The quality of air in the vicinity of 27 sour gas processing and sulphur recovery plants was assessed in 34 two to four week surveys by two mobile laboratories. Three technicians rotated between the two trailers, keeping them in operation every day of the year except during equipment breakdown and annual equipment overhaul. Each of the laboratories continuously monitored sulphur dioxide and hydrogen sulphur along with several meteorological parameters such as wind speed and direction, barometric pressure and relative humidity.

Air Pollution Source Monitoring

Individual pollution sources at various plants throughout the province were sampled to check compliance with emission limitations. With sulphur plant incinerator stacks in 1971 being surveyed by the Energy Resources Conservation Board, much needed emphasis was placed on monitoring those industries whose stacks had not been monitored at all or not extensively.

During 1971, four university students employed for the summer obtained 349 samples from 75 pollution emission stacks at 36 plants throughout the province, including fertilizer, asphalt, cement and power plants, pulp mills and numerous other industries. Although the number of stack surveys changed little from the previous year, the depth of the individual surveys and the number of pollutants sampled and analyzed increased substantially.

Vegetation Sampling

To study the effect of sulphur dioxide on vegetation, 252 vegetation samples were gathered in 1971 by the Department of Lands and Forest. This represents an increase of about 47 per cent over 1970 in the number of samples. The analysis of the vegetation samples was carried out by the division's laboratory.

Complaints

Increased public education and awareness led to 162 air pollution complaints received by telephone and 23 air pollution complaints received by mail. Of these complaints, 110 investigations were carried out by members of our staff. The majority of complaints were received from the Edmonton area.

Special Projects

As in the previous year Geoscience Research Associates Ltd., was retained to operate the meteorological equipment and collect data for the department.

The odor and noise surveys for Edmonton and Calgary were initiated late in 1971 and were in the preliminary stages at the end of 1971.

The Edmonton and Calgary emission and source inventories were initiated late in 1971.

Information Requests

For the greater part of 1971 requests for information were handled by the Information Division, however 248 written requests for information were answered by the Air Pollution Control Branch. In addition, approximately 18 individual requests for information were handled primarily by the engineering staff of the branch, and seven requests for speaking engagements were filled.

WATER POLLUTION CONTROL BRANCH

The responsibility of the Branch was basically one of assessing and controlling water pollution in Alberta.

Detailed sampling surveys were continued throughout the year to assess the quality of surface waters, industrial effluents, and municipal waste discharges. Assessment of surface waters was accomplished by manual sampling and the use of automatic monitors. One additional monitor was purchased during the year and an order was placed for another. This brings to three the number of robot water quality monitors now in service and will provide continuous recording of prime water quality parameters pertinent to water pollution.

The national water quality data bank system (NAQUADAT) was incorporated for storage and retrieval of all laboratory and field survey data. This system is capable of storing all types of water relevant analyses: chemical, physical, bacteriological, biological and hydrometric, in surface waters, ground waters, waste waters and sediments. It provides the initial step in consolidating data into an overall river basin management scheme.

Surface Water Monitoring

The major rivers in Alberta, including the Athabasca River, North Saskatchewan River, Oldman River, Red Deer River, Bow River and South Saskatchewan River were sampled once a month during 1971. Drywood Creek, Jumping Pound Creek, Peace River, Smoky River, Wapiti River, Crowsnest River, Vicary Creek, Blindman River and numerous smaller streams were sampled on a less frequent basis. Many of these streams, such as the Pembina River and Bear River, were surveyed as a result of a complaint.

The division's water quality monitor operated on the North Saskatchewan River near Vinca Bridge for over 2,300 hours during the winter of 1971 and over 2,200 hours on the Bow River during the summer months. The second monitor was put into operation on the Red Deer River near Nevis. This monitor operated for almost 2,300 hours during the winter months.

Surveys were conducted once a month on Gull, Wabamun, Isle, Miquelon, Hastings, and Cooking Lakes. Lac La Nonne, Lac Ste. Anne, Sylvan, Pigeon, and Buffalo Lakes were sampled on a seasonal basis.

A total of 731 samples were taken from these rivers and lakes during 1971. These included routine samples for pollution assessment studies associated with lakes, and surveys resulting from a complaint.

Tests for specific parameters, such as heavy metals, chlorinated hydrocarbons and pesticides were conducted during the year.

Industrial Monitoring

Sampling of industrial waste discharges to surface waters was co-ordinated with river surveys. In most cases 24-hour composite samples were obtained. A total of 330 samples were taken during the year including samples for heavy metals and chlorinated hydrocarbons. Sludge samples taken during these surveys also included analysis for heavy metals.

Special Studies

Primary productivity studies were initiated on Gull, Hastings, and Cooking Lakes during the summer months of 1971. These studies, conducted by two Alberta Ecology Corps members, were not completed during the year. Other activities conducted during the year by members of the Alberta Ecology Corps included source inventory of effluents entering streams in the immediate Edmonton area, and surveys of summer cottages located on Lake Wabamun and Lac Ste. Anne.

The branch participated in a study by the Department of Agriculture to determine the degree of migration of Tordon (Picloram) in soil. The areas of investigation were near Sedgewick and Falher.

Complaints

Fifty-one complaints involving water pollution were investigated during the year. In some cases, complete sampling surveys were made to determine pollution effects on streams and lakes.

Information Requests

There were 459 requests for information received by the branch during 1971. A greater portion of these requests came from students requiring information for school projects and studies.

MUNICIPAL ENGINEERING BRANCH

Calgary Office

The concept of having one engineer visit the Calgary office during Monday afternoon and Friday morning of the first full week of every month was continued at the beginning of 1971 but was curtailed due to the heavy volume of work in the Edmonton office.

Inspections

During 1971 this section conducted 171 water and sewerage inspections in 119 communities. In addition, 30 swimming pool inspections were carried out during the year.

The majority of the water and sewerage inspections were concerned with investigating complaints and inquiries, matters relating to proposed facilities, and inspecting progress of new construction. Inspections of a routine or general nature were severely cut back due to the heavy work load in the Standards and Approvals programs. This has accounted for the decrease in the number of inspections from the previous year.

There was an increase in the number of general inquiries and request for information related to water, sewage or swimming pools.

As of December 31, 1971, 267 communities were served with water and sewerage systems; 247 communities had water systems, 18 of which did not have sewerage systems; 249 communities had sewerage systems, 20 of which did not have waterworks systems.

Swimming pool inspections consisted of initial inspection of newly constructed pools or follow-up inspection of pools which required changes or additions.

Fluoridation

Fluoridation of municipal water supplies and its operation was under the control of the Municipal Engineering Branch.

Communities fluoridating their water supplies were required by regulation to forward monthly reports outlining their program. These reports were reviewed, and communities were notified of discrepancies in reporting or any deficiencies in their fluoridation program.

The population served by controlled fluoridation stood at 577,604, representing 47.1 per cent of the population served by piped water systems and 35.6 per cent of the population of Alberta.

There were 36 communities artifically fluoridating their water supplies in 1971.

Sampling

Samples submitted to the laboratory from water supplies, sewerage systems and swimming pools were mainly those required for control purposes and for use in answering specific inquiries or problems. The following samples were submitted:

Water, River	—	255
Sewage	—	234
Miscellaneous	—	50
TOTAL	—	539

Summer Sampling Program

The program of sampling sewage treatment facilities during the summer (May to September) was continued in 1971. Under this program the operation, maintenance, performance and adequacy of a facility was reviewed in detail. Field work was carried out by two university students and a technologist. This program greatly assisted in the up-grading of sewage treatment facilities in the province. A total of 12 plants were sampled.

Operator's Schools

The water and sewerage operator's schools were continued in 1971. A first year school was held with 132 operators in attendance.

Arrangements were made to conduct a second year operator's school in 1972.

The attendance to date for these schools was as follows:

Completed first year course	658
Completed second year course	423
Completed third year course	380
Completed graduate school	241
Number of communities represented	209

Certification and Classification

Under this program six municipal systems were classified and 109 operators certified in accordance with the guidelines established by the Western Canada Water and Sewage Conference. The certification of operators was on a voluntary basis.

Special Surveys

Two special surveys were conducted by the section during 1971. These surveys were part of a preliminary study to determine the need and feasibility of providing waterworks and sewerage systems in the hamlets of West Edson and Nacmine.

House to house interviews were conducted to assess the existing conditions and adequacy of individual water and sewage disposal facilities. Samples of well waters were obtained for chemical and bacteriological analyses. The hamlets were topographically surveyed in order to determine the possible locations of the water distribution and sewage collection systems, water supply and sewage treatment facilities.

The data and information gathered during the surveys were compiled in an engineering report which also outlined recommended layouts of systems and their estimated costs.

The report for the hamlet of West Edson has been published and the systems are presently being designed by a consulting engineer.

Correspondence Course

This course was offered through the Western Canada Water and Sewage Conference and was designed for water treatment plant operators. The Municipal Engineering Branch supervised the 13 sessions and provided assistance to those enrolled in the course.

A summary of the course for Alberta operators is outlined below:

	1962-1970	1971	Total
Number commencing course	127	13	150
Number completing course	71	7	78
Number passing course	61	*	*
Number of communities represented	64	6	66

*The seven men who completed the course in 1971 will be writing their exams in 1972.

Health Units

Medical Officers of Health and/or Public Health Inspectors were contacted during inspection trips. Problems related to water, sewage, solid waste disposal or swimming pools were reviewed with them and assistance was given where matters concerning the division or of an engineering nature were involved.

POLLUTION CONTROL LABORATORY BRANCH

The laboratory continued analytical activities in co-ordination with the pollution control programs of the division as well as processing pollution samples for other departments and agencies.

The year 1971 was particularly significant due to several factors. In July, analysis on water samples pertaining to domestic water supply were commenced resulting in a remarkable growth of samples and tests. Automation in testing was introduced successfully to a relatively restricted degree. Trace analysis for toxic compounds or elements was expanded.

The following statistics indicate the quantity of work performed. In total, 11,319 samples were received and 70,025 tests performed on them which represents an increase over 1970 in 58 per cent in samples and 104 per cent in tests.

The table below presents the main sample types and the numbers of processed samples and tests.

Water Pollution Control	Number of Samples	Numbers of Tests
Surface water (river, lake, etc.)	731	12,220
Domestic water supply	3,775	34,577
Industrial waste water	330	3,964
Sewage	395	3,982
From other departments and agencies	581	8,284
Miscellaneous	52	196
TOTAL	5,864	63,223

Air Pollution Control	Number of Samples	Numbers of Tests
Field monitors	4,805	5,537
Vegetation samples	252	252
Stack emission	349	956
Total suspended particulate matter	49	57
Total	5,455	6,802
GRAND TOTAL	11,319	70,025
Per cent increase over 1970	58	104
Per cent increase over 1960	543	1,696

Tests

Due to the steadily growing necessity for more detailed sample analysis, test procedures covering additional sample constituents were introduced, or were modified as required.

The laboratory was able to test water and air samples for approximately 50 inorganic constituents, about 40 pesticides and for a fairly large number of additional organic compounds.

Domestic Water Supply Program

The program consisted of a service to analyze water samples for chemical constituents in order to determine whether or not the water was potable. This service was provided for the public of Alberta through the Health Units. Until June 1971 it was performed by the Department of Agriculture.

Research Study

"An Evaluation of Health Effects of Air Pollution in Alberta". In 1969, the three-year study sponsored by a federal grant, was established as a joint project of the University of Alberta and the government of Alberta (Department of Health and Social Development, and Department of the Environment).

The laboratory was engaged in analyzing suspended particulate matter which was collected at 13 stations throughout the province on glass fibre filters by high-volume samplers. During the year 1971 a total of 570 filters were processed.

AGRICULTURAL CHEMICALS BRANCH

The administration of the Agricultural Chemicals Act was transferred by Order-in-Council from the Department of Agriculture to this department.

The Agricultural Chemicals Branch assumed responsibility for the administration and operation of this act. Under this legislation, 252 pesticide applicators were licensed to apply pesticides for hire or reward this year. Provincial and municipal jurisdictions have appointed more than 130 inspectors for the administration and enforcement of proper pesticide use, application, storage and disposal, since the act came into force in April, 1970.

Five permits were issued for the use of agricultural chemicals to persons for purposes other than research and testing by officials of universities and research institutions of federal and provincial governments.

BEVERAGE CONTAINER ACT

In April 1971, the Beverage Container Act was passed. Pertinent regulations were passed by an Order-in-Council on November 9, 197l, with the Act and regulations becoming effective January 1, 1972. Basically, the Act required a refund to be paid on any glass or metal soft drink container returned to a retailer. Provisions were also made for the establishment of depots for centralized collection of empty containers.

STANDARDS AND APPROVALS DIVISION

This division was inaugurated in the fall of 1971 and its responsibilities were stated as follows: "The establishment of standards and the granting of approvals of all work affecting the natural resources of the province". It is the "judiciary" arm of the department.

The staff of the division will include persons competent and experienced in the following professional specialties: air pollution control engineering; water pollution control engineering; waterworks and sewerage systems engineering; veterinary medicine; vegetation growth and pathology; natural life biology; land use; and health of people.

During the calendar year 1971, portions of this work were carried out by the Provincial Board of Health and the Division of Environmental Health Services of the Department of Health, and by the Division of Pollution Control, Department of the Environment.

To provide continuity of record for the approvals issued in previous years, this year's annual report will summarize all approvals issued during 1971.

MUNICIPAL ENGINEERING

During 1971, 354 approvals were granted for the construction of new, or extensions to existing water and/or sewerage systems. These were issued to 95 communities in the province.

The value of the approvals for authorizing construction (final approvals) increased 49 per cent to a record high of $54,806,642. The largest increase was in the area of water distribution feed mains and water treatment.

The community of Midlandvale received final approval for a new sewerage system, and Faust and Millet received approvals for new water systems.

REVIEW OF FINAL CERTIFICATES AND ESTIMATED COSTS
OF WATER AND SEWAGE WORKS PROJECTS
– 1971 –

YEAR	NUMBER ISSUED	ESTIMATED COST	YEAR	NUMBER ISSUED	ESTIMATED COST
1953	97	$12,465,396	1962	184	$ 9,427,465
1954	109	$16,455,810	1963	146	$ 8,818,845
1955	107	$17,524,020	1964	180	$33,758,486
1956	99	$15,803,965	1965	195	$16,632,629
1957	110	$11,430,812	1966	176	$16,895,259
1958	132	$ 9,795,223	1967	187	$19,974,878
1959	160	$15,733,142	1968	244	$35,652,155
1960	189	$16,820,264	1969	227	$30,090,094
1961	172	$18,876,977	1970	226	$36,716,517
			1971	249	$54,806,642

CERTIFICATES ISSUED DURING 1971

PROVISIONAL CERTIFICATES		FINAL CERTIFICATES	
Number Issued	**Estimated Cost**	**Number Issued**	**Estimated Cost**
New Systems Water & Sewerage			
Water 3		2	
Sewer 4		1	
Total 7	$1,076,100.00	3	$270,500.00 (3 communities)
Water and Sewer Extensions			
19	$3,060,072.00	112	$17,711,788.00 (56 communities) (1 miscellaneous)
Water Treatment, Supply & Storage			
32	$10,620,090.00	63	$20,824,273.00 (33 communities) (7 miscellaneous)
Sewage Treatment			
41	$9,374,842.00	45	$10,409,711.00 (33 communities)
Storm Sewers			
6	$4,284,050.00	26	$5,590,370.00 (16 communities) (2 miscellaneous)
Total			
105	$28,415,154.00	249	$54,806,642.00

1971 WATER, SEWERAGE AND SEWAGE TREATMENT SUMMARY FOR ALBERTA

Population Group	**Number of Communities**	**Served With Waterworks**		**Served With Sewerage**		**Number With Sewerage and Sewage Treatment**	
		Number	**%**	**Number**	**%**	**Number**	**%**
Over 10,000	7	7	100	7	100	7	100
3,000 - 10,000	24	24	100	24	100	24	100
1,000 - 3,000	58	57	98	56	97	56	100
500 - 1,000	42	40	95	40	95	40	100
300 - 500	50	46	92	47	94	47	100
150 - 300	66	55	83	56	85	56	100
Under 150	34	20	59	19	56	19	100
TOTAL	281**	249		249		248	
AVERAGE			88%		89%		100%

Note: Jasper; Banff; Waterton; Lloydminster; hamlets with neither water nor sewerage systems; institutions and summer villages are not included.
** – of these 281 communities, 268 have water and/or sewerage.

Fluoridation

No fluoridation systems were approved in 1971. The number of municipal systems with fluoride adjusted water supplies is 36.

Sewage Treatment

Approvals for the construction of sewage treatment facilities were issued to the few remaining municipalities with sewage collection systems and no sewage treatment facilities.

The Central Mortgage and Housing Corporation financial assistance program (under Part VI B of the National Housing Act) continued in 1971. In total 34 communities took advantage of the program. Of the $9,000,000 (C.M.H.C. funds) allocated to Alberta, $8,924,827 was in turn allocated to the communities.

Swimming Pools

A total of nine public and 21 semi-public pools were recommended for approval in 1971. Public pools were approved for the communities of Calgary (3); Coaldale (1); Edmonton (1); Grande Cache (1); Provost (1); Fort McMurray (1); and Niton Junction (1).

The accompanying table shows the number of pools in Alberta.

Responsibility for swimming pools was transferred from the Public Health Act to the Clean Water Act. Specific regulations and guidelines were prepared for inclusion in the Clean Water Regulations.

SWIMMING POOLS IN ALBERTA AT DECEMBER 31, 1971

CATEGORY			NUMBER
Public			108
Semi-Public			182
	Apartments	80	
	Motels & Hotels	56	
	Clubs	28	
	Institutes	8	
	Camps	10	
National Parks			12
Department of National Defence			8
TOTAL			310

AIR POLLUTION CONTROL ENGINEERING

A total of 87 approvals (about the same as last year) were granted to new plants or existing plants making changes in their operations. Also, 56 incinerators were approved for installation in the province. Because the jurisdiction for gas and sulphur plants was transferred to the Energy Resources Conservation Board in 1970, a total of 39 Provincial Board of Health approvals were cancelled and reissued by the Board.

WATER POLLUTION CONTROL ENGINEERING

Thirty-five Provincial Board of Health approvals were issued for the release and control of waste waters. Twenty-five of these were concerned with asphalt plant operations and the balance were associated with the petro-chemical, hydro-electric power, pulp and paper, and the meat packing industries. Approvals were also granted for 18 applications of chemicals for mosquito control, and 29 applications of chemicals for aquatic weed control.

WATER RESOURCES DIVISION

The Water Resources Division moved to a new department: one which afforded new challenges and opportunities. The transfer to the Department of the Environment, together with the change in government, directed considerable activity toward the review and reassessment of policies and programs.

It is with deep regret that we note the passing of Mr. P. M. Sauder on August 27, 1971 at the age of 89. Mr. Sauder, who served as Director of Water Resources Division during the years 1940-44, was one of the great historical figures in the development of irrigation in southern Alberta.

Canadian Council of Resource and Environment Ministers

The Canadian Council of Resource Ministers agreed to change their name to include the environment ministers.

The main attention of the C.C.R.E.M., pertaining to matters of water, was directed to the sponsoring of the Prairie Region Water Seminar. The objectives and planning for the seminar were outlined in the 1970 annual report.

The objectives of the seminar were to achieve and exchange views of prairie water matters among local and regional interest groups, government officials, and professionals from universities and consulting firms and to provide an opportunity for senior water resource managers to consider prairie water matters and programs recommended by users, working level planners, technicians and researchers in relation to existing policies and programs.

The original plan for a three-tier structure was implemented, however, the two groups planned for the first tier were amalgamated into one. The only other change to be made was in the structure and purpose of the third tier sessions.

An identical format and procedure was developed by the steering committee for each of the three provincial first-tier sessions (Alberta, Saskatchewan and Manitoba). The issues and subjects identified by the delegates in each province were assembled into 10 categories for consideration at the second tier. Ten elected delegates from each provincial first tier session then joined with ministers and senior water managers from across Canada to further debate these 10 subjects in sessions held in Regina September 20 to 22.

Following the second tier seminar, it was the unanimous concensus of all provincial delegates that the third tier format should be altered to accommodate more than a reporting back of the results from the second tier sessions. It was the wish of the delegates that the appropriate minister attend for at least a portion of each of the provincial third tier sessions to permit an open forum discussion and exchange of views.

The Alberta first tier seminar was held at the Olds Agriculture and Vocational College July 22 to 24. It was attended by 49 delegates from 37 public organizations (47 were invited to participate), together with 12 delegates from five agencies of the federal and provincial governments.

Copies of the proceedings are available. Generally, delegates identified both shared personal goals and shared working group goals for water management, and considered opportunities, conflicts and problems in water use. By a listing of these subjects in order of priority as determined by the delegates, the topics for further discussion at the second tier were selected.

The Alberta third tier was held at the Banff School of Fine Arts December 1 to 3. The Water Resources Division had previously made available to each delegate a summary statement on the policies, programs and activities of government as related to the 10 topics considered at the second tier sessions.

The delegates concluded that all topics discussed in previous sessions could be grouped into three main categories: public participation and communication; management and planning; and financing.

These three subjects were given greater in-depth consideration by delegate working groups and statements, recommendations and conclusions formulated for open forum discussion with the Hon. W. J. Yurko on the second day.

The format and techniques employed in this seminar were unique in many respects. It was a first of its kind in the area of public involvement in water resource management. The evaluation survey by the delegates strongly indicated that one of the major benefits was the exchange of views and ideas, and a consequent broadening of the knowledge, understanding and perspective of individual delegates in the subject of water resource management and development.

Prairie Provinces Water Board

In its second year since reconstitution, the P.P.W.B. drafted by-laws, rules and procedures to guide its future conduct and activities. As the first step in the establishment of a secretariat, measures were taken toward the employment of an executive director.

The board continued studies previously initiated and undertook some new ones.

Natural Flow and Streamflow Forecasting Studies. The board initiated studies for the determination of natural flows and streamflow forecasting, to be carried out jointly by the Canada Department of Energy, Mines and Resources and the Ministry of Transport. The study will be conducted in three phases. The Board's Data Network Planning Committee will review and provide advice for the study; and until the appointment of an executive director, liaison between the Board and the project manager will be through the Data Network Planning Committee.

Water Demand Study. The task force appointed to prepare terms of reference for a water demand study expects to submit its final report to the Board early in 1972.

Water Quality. The Water Quality Task Force continued to examine the water quality management needs in the prairie provinces and to prepare recommendations on water quality.

Battle-Lodge Creek Interbasin Study. Since the Battle-Lodge Creeks are international as well as interprovincial and therefore the subject of a previous agreement, they are not included in the Interprovincial Apportionment Agreement. A study was therefore initiated to determine available supplies and water uses on this system for interprovincial apportionment purposes.

Peace-Athabasca Delta

A major decline in water levels on Lake Athabasca following completion of the Bennett Dam in 1968 gave rise to major public concern over environmental and ecological ramifications in the delta area at the west end of Lake Athabasca.

The Water Resources Division began a preliminary assessment of hydraulic conditions in the delta, and this work was intensified.

The area mainly affected ecologically is within the boundaries of Wood Buffalo National Park, and in late 1970, the government of Canada made preparations for a detailed study of the situation, in which Alberta was asked to participate.

In January, 1971, a study force was assembled under the direction of Mr. Doug Hornby consisting of specialists seconded or assigned to the project by federal and provincial government agencies.

A technical advisory committee was established to conduct the various ingredients of the study and overall direction and policy guidance was provided by an intergovernmental liaison committee consisting of a representative from Canada, Saskatchewan and Alberta.

A progress report from the study director to the Minister of Environment Canada on September 1 recommended the construction of limited and reversible works on the west branch of the Quatre Fourches River to provide impoundment of waters that could provide some immediate relief to about 60 per cent of the affected area. This work was proceeded with and completed in late November.

On December 1, the Water Resources Division opened an office at Fort Chipewyan to undertake a continuing hydrologic monitoring program and construct such minor works in the delta area as may be beneficial to the ecological environment.

Saskatchewan-Nelson Basin Study

The Hon. W. J. Yurko and the Hon. D. Getty were appointed members to the Ministers Committee of the Saskatchewan-Nelson Basin Study. Mr. Yurko attended the sixth meeting of the committee held in Regina October l5.

On October 16, 1967, the governments of Canada, Alberta, Manitoba, and Saskatchewan signed an agreement setting up the committee and board and authorizing the current studies over a four-year period at a cost of $5,000,000. The actual study started in April, 1968.

The objective is to study the water resources of the Saskatchewan-Nelson Basin, including the potential additional supply by diversion or storage. The study program includes the preliminary investigation and costing of 55 large dams and 23 diversion possibilities, as well as the preparation of estimates of flow available at each of these sites. Also included is the preparation of an inventory of the flows that could be guaranteed at selected study points in the basin by projects and project combinations.

During 1971 all field investigations were completed and preparations for the final report progressed very favourably.

CENTRAL PLANNING GROUP

The need for an integrated approach to water resource planning, management, and development has dictated a partial reorganization of the Water Resources Division over the past year.

The two major changes included the establishment of a Planning Advisory Board and the formation of a Central Planning Group.

Planning Advisory Board

The function of this board is to discuss and recommend projects and studies to the director for approval; act as a communication channel for the branches; determine the staff commitments required for the approved projects and studies, and make recommendations to the director regarding changes to existing policies, objectives, or programs within the division, or the introduction of new ones.

The membership of the board consists of the chief engineer, all branch heads and regional administrators, the planning co-ordinator, and the director as a standing member. The director advises the board on matters originating with the Executive Committee, Conservation and Utilization Committee, Irrigation Council, or other agencies he is associated with.

Central Planning Group

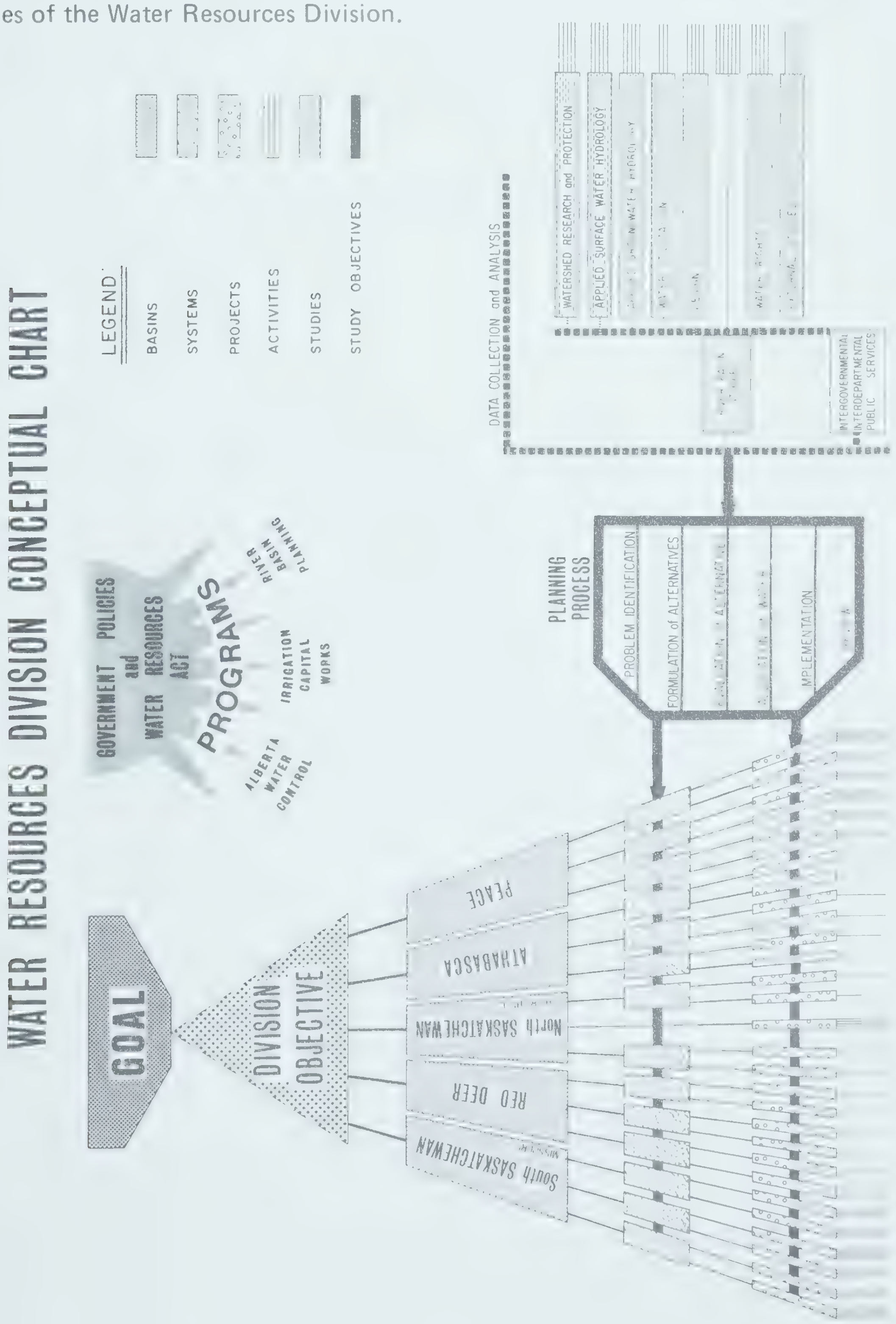
The function of this branch is to act as a secretariat to the Planning Board under the direction of the planning co-ordinator.

Specifically, it is charged with identification of problems and demands in the field of water resources management; formulation of alternative solutions to these problems in the form of projects or integrated water resources systems; evaluation of these projects or systems to ensure best use of the resource and maximum benefit to the greatest number of people; co-ordination and scheduling of inter-branch, inter-agency, or inter-departmental activities related to water resource programs or projects; gathering information related to existing or anticipated programs, and development of information systems; preparation of reports including recommendations to the Planning Advisory Board regarding actions to be taken or projects to be implemented; assistance of implementation of approved projects or solutions; and review of implemented solutions or projects to assess their effectiveness.

To carry out these responsibilities, the Central Planning Group is divided into the following sections: Demand and Evaluation; Project Formulation; Project Reconnaissance; Systems Analysis; and River Basins. Basin engineers are assigned to co-ordinate all water resource planning activities within each of the five major river basins in the province: North and South Saskatchewan, Red Deer, Athabasca and Peace River.

During the past year the following tasks were completed: preparation of 14 preliminary engineering reports for the Saskatchewan-Nelson Basin Board; preparation of 28 reports on various projects and studies; review of 58 reports from other branches and regions; creation of divisional conceptual chart; compilation of schedule for divisional projects; establishment of various sections within the Central Planning Group to carry out functions required; co-ordination of five major seminars; co-ordination of inventory of all division reports from 1966 to 1971; and establishment of contact with 43 different agencies for exchange of technical information on water resources planning.

The accompanying conceptual chart depicts the goal, objective, programs and activities of the Water Resources Division.



It is the goal of the Water Resources Division to ensure the optimum management and development of Alberta's water resources to meet the needs of society, in whatever form of economic and social development it determines for itself.

The division objective is encompassed in existing policies, legislation, and programs which change from time to time but in varying degrees provide a means of obtaining the stated goal.

For administrative as well as for practical reasons the river basin was selected as the basic planning unit. Five major basins have been chosen: South Saskatchewan, Red Deer, North Saskatchewan, Athabasca and Peace.

Each of these major basins contain numerous existing and potential water resource systems and projects.

By application of the planning process it is possible to formulate, evaluate and select alternative water resource projects or system of projects to satisfy society's needs in each river basin or sub-basin, region or sub-region. This process also includes allocation of water and implementation and review of projects.

It is the specialized function of each branch to provide information and services which can be utilized in river basin studies, the planning process, by other government agencies, or the public in the effective management and efficient use of the water resources of Alberta.

Other agencies, both public and private, may also be involved in data collection and analysis essential to effective planning and implementation of solutions to water resource problems or demands.

HYDRO-ELECTRIC DEVELOPMENT

Bighorn Site

Work continued on the Bighorn site which is located on the North Saskatchewan River 80 miles west of Rocky Mountain House. The dam will be 1,400 feet long, 300 feet high, and will contain 3,800,000 cubic yards of material. The reservoir will be 20 miles long, with a total area of 13,700 acres. The area flooded, in addition to the present flood plain, is approximately 9,000 acres. The total live storage of the project will be 1,165,000 acre-feet. The full supply level will be 4,335 geodetic datum with a drawdown of approximately 120 feet. Two turbines, each capable of producing 54,000 kilowatts, will be installed. The total cost of the project is expected to be between $35 to $45 million.

Work on the project during 1971 included completion of the foundation cutoff, which is an item of particular interest. The wall has a maximum depth of 206 feet below river bed level to the bottom of the buried gorge at elevation 3,845 and is extended upwards to elevation 4,075 within the dam core, giving it a total depth of 230 feet. The wall was constructed by excavating a narrow deep trench. Stability was provided by means of a slurry consisting of a colloidal suspension of bentonite in water. This slurry, having a head in excess of groundwater table pressure and a specific gravity greater than 1.0, maintains the stability of the vertical walls by hydrostatic pressure. The cutoff was constructed in a series of short lengths with vertical joints which, after backfilling, resulted in a continuous concrete wall of short interlocking panels.

This two foot thick wall was keyed a minimum of two feet into the bedrock at its lower limit and its top was embedded 30 feet into the impervious central core of the dam. The 30 foot section extending into the core is of formed concrete, and was topped with a thin (l/8 inch) galvanized mild steel membrane protruding 15 feet on either side of the wall structure. The joints between butt-ended sheets of this membrane were lapped with neoprene to effect a waterproof seal. This construction prevents a short circuit of seepage over the wall in the event that the core material surrounding the wall should develop rupture cracks as a result of settlement and consequent knitting of the wall into it.

As a further precaution against cracking of the core, a highly plastic zone of pure bentonite was placed above the top of the wall and this will deform to seal any cracks in the surrounding core material.

With the completion of this wall work was started as building up the core, and placing the fill.

The spillway structure was completed in November except for the pre-cast bridge deck and the stoplog hoist.

Construction on the powerhouse was started and continued close to schedule throughout the winter of 1971.

International Inspection

A summer inspection was made along the international boundary by helicopter and several on-the-ground inspections were made of Sage Creek. The licensed property in Canada changed hands in 1971. Some difficulty was encountered in getting water to the United States users and it was found necessary to utilize Water Resources maintenance personnel to clear the channel on the Canadian side of the boundary. It was decided that transfer of licenses on Sage Creek will not be processed until complete re-evaluation of the scheme has been made.

Two meetings were held with Montana State Water Board and the United States Geological service representatives, and it was agreed this problem is well in hand.

MAINTENANCE BRANCH

The maintenance program ensures continued operating efficiency of those water control projects for which the Water Resources Division is responsible. Maintenance of these projects involves the repair of dams and related hydraulic structures, the replacement of short-lived structures that are not individually of major cost, and the application of a controlled preventive maintenance program.

Regular activities of the branch are as follows: carry out regular inspection and assessment of project conditions, including a determination of the current value of the project in order to justify maintenance expenditure; engineer and execute a planned preventive maintenance and repair program; and collaborate with the Design Branch in an effort to avoid the use of unsuitable materials and methods in the design and construction of projects which would result in maintenance expenditure.

The branch's priorities are to maintain those provincial projects which were built by the Water Resources Division without participation of any other government or private agency; to maintain those projects which were built by the Federal Department of Regional Economic Expansion (P.F.R.A.) and have been transferred to the province; to maintain projects located in Improvement Districts (These projects were built by Water Resources and the cost of initial construction was shared with the Department of Municipal Affairs); and to maintain projects constructed by Water Resources under a joint program with various local authorities (Alberta Water Control Plan).

During 1971, the branch continued maintenance of the Aetna, Leavitt and Mountain View main canal and headworks; repaired the Moonshine Lake Dam; repaired and reconstructed the Gordy Drainage Project; repaired the concrete structure on the Rainy Creek Project; repaired a structure on the Dapp Creek Project; continued maintenance of the Kleskun Hill Flood Control Project; repaired the Burnstick Lake Dam and spillway; did general maintenance work on the Bow Island Plots, Lee Creek Watershed, Sage Creek and the Spring Creek Research Basin; did general maintenance on seven drainage and flood control projects in the Peace River Region; and inspected 14 water control projects and provided an assessment of maintenance requirements.

SOILS, GEOLOGY AND GROUNDWATER BRANCH

Branch activities have been broadened since departmental reorganization to include increased emphasis on contamination of earth resources, particularly related to solid waste disposal. Such involvement, however, is not new to the branch, since considerable attention had previously been given to liquid waste disposal by sprinkler irrigation in communities in southern Alberta. Work on nitrate, gasoline and oil contamination of groundwater has also been underway for several years.

Rural water development continued to be the main source of public contact even though the program was severely curtailed in 1971. Service to other government departments increased, particularly to the Departments of Highways and Transport, and Municipal Affairs.

Liaison with the Energy Resources Conservation Board was and is gradually developing in the area of groundwater use by the oil and gas industry.

In summary, 1971 was a year of program and activity extension to a broader coverage of the earth sciences.

Inventory, Data Gathering and Applied Research

The groundwater features, chemistry and regime of the Lee Creek watershed were mapped. Preliminary interpretation of drilling suggested that a major gravel aquifer underlies the town of Cardston. Work was started on the final report. A study in the Fort Vermilion area of shallow groundwater fluctuations on cultivated versus uncleared land was almost completed. Preliminary indications were that the distance to groundwater is considerably greater on cultivated land.

Groundwater resource inventory studies were completed at Fort Vermilion-LaCrete, Worsley and Manning, as a result of the work, dugouts were recommended as the best method of maintaining an adequate rural water supply of good quality.

Considerable field exploration was done on the Beverly and Red Deer buried channels. The Beverly Channel (Edmonton to Cold Lake) was selected for evaluation of data processing and selective retrieval systems to allow comparisons to be made between a private system and GOWN (Groundwater Observation Well Network). This study of some 4,000 individual records will enable a system to be selected for provincial application.

Work continued on two major projects dealing with groundwater contamination: nitrates southeast of Lethbridge and commercial gasoline at Elk Point. A third project at Bon Accord involving oil contamination was completed, and results indicated that the source was indigenous and naturally occurring.

Reservoir sealing studies were underway or completed at Fort Vermilion, Manning, Drumheller and Lethbridge. Studies involved the use of bentonite and sodium carbonate, and results indicated that sodium carbonate is more effective and more economical. Results of laboratory studies on the project are being prepared for publication.

At the end of the year, branch personnel were engaged in work on multiple waste disposal and sanitary landfills, particularly as they relate to earth sciences. Data gathering continued on the Irrigation Study Basin at Lethbridge and the trapped lake salt balance study at Del Bonita.

Liquid waste disposal by sprinkler irrigation received increased attention throughout the province. Large systems at Taber and Vauxhall were in operation while smaller projects were started or planned at Granum, Calgary and Devon. This technique shows much promise but must still be approached on an applied research basis as every project has been unique. Disposal of farm waste began to receive attention but not to the desired extent. Laboratory studies on sewage sludge and effluent utilization resulted in several technical papers being accepted or considered for publication in Canadian journals.

A remote sensing interpretation was completed for the Wabamun Lake area. Results indicated distinct temperature and current patterns.

The branch worked actively to promote the use of new remote sensing techniques for environmental research, and became the provisional repository for much of the more sophisticated provincial sensing material.

Services

A report was prepared on major aquifers and groundwater availability in the Alberta portion of the Saskatchewan-Nelson Basin for incorporation into the overall board report. This report is being modified and expanded for general distribution and use in Alberta.

Studies were initiated in the Peace-Athabasca delta on the relationship of the groundwater regime to plant distribution and surface water fluctuations.

Technical services were supplied on request, to the Departments of Municipal Affairs and Highways and Transport in the form of contract specifications, tendering and construction supervision of four wells at Grande Cache and five wells at Sherwood Park.

Planning and allocation data were made available to planning boards, committees, and administrative agencies regarding groundwater availability and general technical expertise.

A major soil classification for irrigation feasibility study was completed on the approximate 600,000 acre Sturgeon basin. Results indicate that 56 per cent of the area is fair to marginal for irrigation purposes. No soils were classified as good (category 1).

Studies related to irrigation suitability, groundwater control and reservoir water seepage losses were conducted on the grounds of the new Medicine Hat College.

Services under the Rural Water Development program were confined to technical assistance to a small number of local problem areas or co-operative feedlot enterprises with the exception of a few individual development problems carried over from 1970. Interest among farm operators in this program continues at a high level despite severe curtailment.

Service to irrigation districts continued at a high level under two major programs: irrigable soil classification at the request of project management, and inputs to the Irrigation Capital Works program.

In addition to the above, the branch carried out damage claim appraisals for irrigation district management and aided Irrigation Rehabilitation Planning by providing soils, geology and groundwater appraisals.

Services of the laboratory in Lethbridge continued at a full utilization level both from the standpoint of work for the division on soil and water chemistry, soil physics and engineering soils for construction projects, and service to applied research and interdepartmental projects.

HYDROLOGY BRANCH

River Regime

This area of endeavour, which requires a specialized understanding of river behaviour with regard to the interaction of flowing water and its confining boundaries, continued to be a technical service to many other branches in the Water Resources Division.

A large increase in the number of applications for pipeline river crossings and subdivisions being processed through this office was noted. Applications are required to ensure that pipelines will not eventually become exposed or that newly developed private parcels of land will not be inundated by flood waters or shifting channels.

The consequences of high flows and shifting channels along public and private property continued to bring in large numbers of complaints and inquiries about government aid available for alleviating these problems. Only technical assistance was provided by the Hydrology Branch. In the matter of flooding, two comprehensive floodplain studies were completed for the towns of High River and Okotoks where flood levels were delineated and remedial works suggested.

Two large scale hydraulic models were constructed in co-operation with the Alberta Research Council and the University of Alberta. A model of the Bassano Dam was used to test various alternatives for increasing the spillway capacity, reducing the level of sediment accumulation behind the dam, and testing the channel stability below the dam under varying conditions of flow and spillway construction. The second model consisted of two types of rock weirs proposed as a means of raising water levels in Lake Athabasca, and it was used to check flow characteristics and stability of the structures.

The practical research aspects of river behaviour were continued with major studies being carried out on the North Saskatchewan River in conjunction with the Bighorn Dam and on the Pembina River in conjunction with man-made river cutoffs near Westlock. Both of these studies endeavoured to measure physical changes to a river system as a result of man's interference with the natural flow condition of the river.

Project Hydrology

There were two major achievements in the areas of project hydrology and supporting activity.

The first was the culmination of several years' effort in producing hydrometric data files, summaries, and analyses by computer programs. This proved to be somewhat troublesome in view of the mass of data being processed; however, 1971 saw the completion of this phase of the work, and production of records and analyses in printed form is in its final stages.

The other achievement was the active participation of the branch in the inter-governmental Peace-Athabasca Delta Project. The hydrologic, hydraulic, and engineering phases of the project were directed and co-ordinated by the Hydrology Branch. The project was designed to attack the problems of the Peace-Athabasca delta area from all aspects with a bearing upon the people of the area or upon the ecology of the area. A full understanding of the total problem in the delta would not have been possible without the concentrated effort of the various disciplines involved.

On a smaller scale, dozens of reports dealing with the design of water control projects were completed.

Flow Forecasting

Flow forecasting activities assumed public prominence during the summer of 1971 when excessive rainfall in the Lesser Slave Lake-Whitecourt-Edson region during June and July produced damaging floods on the Paddle River and on streams draining the Swan Hills.

During a six-week period, five heavy rainstorms in the Swan Hills kept streams at a high level and ensured near-saturation watershed conditions which combined with intense precipitation to cause flood peaks in the order of a one-in-20 year event on most streams. In several cases three successive peaks of similar magnitude resulted.

Flood advisories were prepared and issued daily during critical periods. Public interest prompted an almost hourly request for information from local news media. Prior to the most significant flood peaks the Emergency Measures Organization was notified of potential danger to certain areas.

The unspectacular, but essential, groundwork necessary for competent forecasting in other areas of the province continued throughout the year.

Spring Melt Flooding

An exceptionally heavy snowpack in the central and east-central portions of the province following, in the case of the Lac La Biche area, a wet autumn led to excessive volumes of runoff during the latter half of April. Many of the streams in the Edmonton-Lac La Biche-Vermilion region peaked at discharges approximating a one-in-ten year occurrence.

In addition, a broad band of territory fron Didsbury through Hanna experienced spring floods of a magnitude in the order of a once-in-50 year event.

EXTERNAL ADMINISTRATION BRANCH

Water Rights

A total of 267 applications for water rights were received and recorded in 1971, broken down as follows: domestic 157; municipal 6; irrigation 48; industrial 17; drainage and flood control 15; other 24.

A total of 311 interim licenses and 217 final licenses for all purposes were issued during the year, 46 projects were transferred, and 323 cancelled.

Preliminary work began on the placing of all water rights records on computer, and new administration maps are in preparation with approximately 40 per cent of the water rights information transferred from the old maps.

A study of the Lodge Creek and Battle Creek Drainage Basins was undertaken in the fall of 1971 for the Prairie Provinces Water Board and to update the Water Rights records.

The microfilming of plans and files continued, with 4,821 plans totalling 14,547 microfilm images and 201,360 file images filmed in 1971.

Irrigation Water Agreements

During the year, 33 water agreements were received from the Bow River Irrigation District (Federal Block) for approval, registration, and filing.

The accompanying table shows the major irrigation districts in Alberta and the areas that received water during the year 1970.

STATISTICS IN CONNECTION WITH THE MAJOR IRRIGATION DISTRICTS IN ALBERTA

NAME OF DISTRICT	CONSTRUCTED AREA	RECEIVING WATER IN 1970	SOURCE OF SUPPLY
St. Mary River Irrigation District	197,978.0 Acres	134,978.0 Acres	St. Mary River
Magrath Irrigation District	8,506.0 Acres	5,000.0 Acres)	All through the
Raymond Irrigation District	20,700.0 Acres	15,000.0 Acres)	works of the
Taber Irrigation District	60,484.0 Acres	50,094.0 Acres)	S.M.R.I.d.
Western Irrigation District	100,000.0 Acres	15,000.0 Acres	Bow River
Eastern Irrigation District	200,000.0 Acres	199,729.0 Acres	Bow River
Bow River Development (Federal)	94,000.0 Acres	70,580.0 Acres	Bow River
Bow River Irrigation District	23,102.0 Acres	7,000.0 Acres	Bow River
Mountain View Irrigation District	3,719.0 Acres	2,789.0 Acres	Belly River
Leavitt Irrigation District	4,523,0 Acres	4,523.0 Acres	Belly River
Aetna Irrigation District	6,672.0 Acres	2,523.0 Acres	Belly River
United Irrigation District	33,972.0 Acres	15,019.0 Acres	Belly River
Lethbridge Northern Irrigation District	89,358.0 Acres	49,783.0 Acres	Oldman River
McLeod Irrigation District	NOT OPERATING		Oldman River
Ross Creek Irrigation District	2,069.0 Acres	1,000.0 Acres	Gros Ventre Creek
TOTALS........	845,083.0 Acres	573,022.0 Acres	

Property Control

The property control section is responsible for the acquisition of right-of-way required under all programs. This includes appraisals, negotiations, agreements, and completion of transactions.

Complaints and damage claims are investigated. Land title and pipeline searches are conducted and certain lands owned by the Department of Agriculture is leased. Easements and placing of caveats are the responsibility of this section along with the placing and removal of reservations on crown lands. Certain phases of subdivisions come under the scrutiny of this section.

The section also requests surveys and ensures that plans are approved and registered.

During 1971 land was purchased for irrigation districts; East-West Prairie River diversion; Grimshaw flood control; Bigelow Dam; Coal Lake project; and Sawridge Creek. Cost of right-of-way was investigated for many small projects and several easements were obtained.

Water Well Inspection Services

During the past year over 530 inspections were carried out relative to water well drilling regulations, well complaints, and flowing wells.

Water well drilling permits were issued to 242 operators in the province and completion reports submitted by the contractors totalled 2,700. All the information received was passed on to the Groundwater Division of the Research Council of Alberta to assist the geologists in their groundwater studies. There were 42 industrial and municipal water wells registered during the year.

A compiled water well drillers directory was published, listing all licensed water well contractors, the number and type of machines, and those who are members of the Alberta Water Well Drilling Association. Over 300 copies were distributed to drillers, individuals, and other government agencies.

The accompanying table shows the relationship between the number of drillers, the number of report submissions and the number of members in the Alberta Water Well Drilling Association for the years 1967 to 1971 inclusive.

WATER WELL DRILLERS

	1967	1968	1969	1970	1971
No. of Registered Water Well Drillers	210	217	234	227	242
Full Time	91	97	99	77	76
Part Time	59	62	69	60	62
Occasional	54	57	32	65	75
Out of Business or Dormant	6	1	34	25	29
Members of The Alberta W. W. Association	56	59	59	55	52
No. of Drilling Rigs	239	253	267	258	292
Rotary	111	115	111	118	134
Cable Tool	83	85	89	88	102
Jeffing	22	31	34	27	31
Boring	23	22	32	25	25
No. of Drilling Reports Received	1970	1900	2377	2520	2700

Hydrographic Surveys

During the past year sonic sounding surveys were conducted on 22 lakes in the province and the information was finalized in the form of hydrographic maps showing lake bed contours, water volume, and area. Over two hundred copies of the hydrographic maps were distributed to other government agencies and the public.

Bench Mark Surveys and Lake Levels

Twenty-two permanent iron bench marks were constructed beside various lakes to serve as a permanent datum in recording periodic surface levels of fluctuations for long term records. Geodetic datum elevations were surveyed into 33 bench marks and over 400 levels were taken and recorded on over 150 different lakes throughout the province. In addition, outlet surveys were carried out on eight lakes to establish the control point elevations and location.

LAND DEVELOPMENT BRANCH

The purpose of this branch is to deal with water resources activities which affect land. These include designation of watershed protection zones within riverbreak, watercourse, and shoreline areas; investigation of individual farm surface drainage and irrigation projects; and applied research projects to study the use of water for irrigation throughout the province. This is used to regulate industrial and agricultural activities within watershed protection zones to prevent deterioration by erosion, surface runoff, and incompatible land uses. Recommendations on feasibility of surface drainage and irrigation projects for licensing purposes are also prepared by this branch.

Watershed Protection

During 1971 the Land Development Branch began active participation in the establishment of terms and conditions for industry from the point of view of protecting the water resources affected. These terms and conditions are applied through clauses on surface lease agreements issued by the Special Land Use Branch, Department of Lands and Forests.

The land development planning aspect of the work was also expanded, with submissions made to four different agencies: Land Use Assignment Committee, Alberta Forest Service, Regional Planning Commissions, and Provincial Planning Branch.

Coal

Four large development programs, all involving stripping techniques, were received and investigated. Extensive exploration was also carried out, as the number of new programs indicated. Fifty-six individual programs were received as well as 2l amendments to these programs. (All areas involved were field inspected at least once during the year.)

A report was prepared to indicate the position of the Water Resources Division on this subject. Also established were the monthly company-government meetings at which a branch member represents the division.

Oil and Gas

Gas production took an upswing during 1971 as indicated by the number and size of new gas plants constructed. Seven large plants were investigated as well as 11 small single well plants. Expansions to two others were also studied. A co-operative study program was initiated with two levels of government and the company, integrating studies and efforts into a single program.

Land Use Assignment

Six study area reports were submitted covering groundwater availability, climatology, and watershed protection zones for Medicine Hat, Saddle Hills, Birch Hills, MacKay, Clear River, and Fawcett-Moose Portage.

A provincial map was prepared showing areas of particular importance to the future needs of the division.

Provincial Planning

The branch took part in two studies carried on by the Department of Municipal Affairs. The Hinton-Yellowhead Study was partially completed with studies on three of the seven subregions being submitted. Late in the year the Slave Lake Study with requests for similar participation was received.

Alberta Forest Service

By the end of the year the branch had completed work on four of the 19 subregions of the Foothills Resources Allocation Study being carried out by the Alberta Forest Service. Participation consisted of supplying maps delineating the boundaries of watershed protection zones.

Regional Planning Commissions

Two Regional Planning Commissions requested reports from the branch. The Peace River Commission requested reports on two areas in the Sturgeon Lake Subregion, one of which has been completed, while the Edmonton Commission made a request for similar reports on the County of Leduc.

Mineral Sales Referral Committee

Branch members were appointed to the Referral Committee upon its inception in June. It was created by the Minister of the Environment to review lands scheduled to be put up for mineral lease sale by the Department of Mines and Minerals. The lands were examined from the aspect of possible environmental damage from development, and action was taken where necessary. This action may be in the form of conditions imposed on activity or removal of lands from sale.

Surface Reclamation Task Force

The branch was an active participant in the task force established by the Conservation and Utilization Committee. The branch head was vice-chairman and the section head was secretary. The final report was submitted to the Conservation and Utilization Committee in October.

Remote Sensing

The section head was active in government remote sensing programs and activities.

Farm Water Conservation and Development

The prime objective of the section is to promote better use of water in the agriculture industry. This is accomplished by supplying professional and technical assistance to individuals and groups who use water primarily for irrigation.

Irrigation Feasibility Reports

Sixty-two projects were inspected and 49 reports prepared. All but one were recommended for licensing. In addition, a detailed report of the Lodge Creek drainage basin was completed for the Water Rights Branch.

Surface Drainage Projects

The demand for our services under this program was about the same as last year. There were 393 requests received and 91 projects constructed. Most of the jobs not completed were left because forms of consent were very hard to obtain. In some cases, after initial survey and design the farmer dropped the project because estimated costs were too high.

Irrigated Land Classification

The branch continued to supply classification reports for the irrigation districts as requested. There were 89 percels investigated, 39 reports prepared and eight completed classification surveys performed.

The section participated in the Irrigation Capital Works Project by providing topography classification data to almost all irrigation districts along with agricultural feasibility reports for individual jobs. There were 33 individual reports prepared.

Farm Systems Investigations

Land Forming. The demand for services was average. We received 329 applications, surveyed 12,834 acres, designed 12,894 acres, and ended the season with 4,964 acres leveled. This represents a total expenditure of approximately $347,418 by farmers. Land forming remains consistent and a major part of our program.

Farm Irrigation Systems. In 1971, 1,100 acres were border dyked and 70 sprinkler designs were completed. A detailed report on sprinkler design, installation, and equipment specifications was prepared for the Medicine Hat College.

Irrigation Gauge. The irrigation gauge is used to forecast irrigation needed throughout the irrigation districts. Forecasts are based on daily records of precipitation and evapotranspiration. The information is supplied to local newspapers and radio stations, and in addition, 60 co-operators received the information directly. In 1971, four irrigations were scheduled for alfalfa and three for cereal crops.

Applied Irrigation Research Section

The evaluation of the potential and the limitations of irrigation in central Alberta and Peace River regions continued in 1971. Irrigation in these areas improved both yield and the quality of the crops tested.

The results obtained by proper irrigation and scheduling in any given growing season reflected both seasonal rainfall and the distribution of this rainfall. In 1971, both central Alberta and Peace River regions experienced a dry spring until mid-June, with above average rainfall from mid-June until mid-July, and drier than normal conditions after this time.

Scheduled irrigations of alfalfa increased yields of alfalfa hay from between 0.6 and 1.0 ton per acre depending on the type of hay stand involved. Irrigation significantly increased protein and phosphorus content of the forage. The following table indicates selected data obtained at the alfalfa plots located at the Oliver Tree Nursery.

	Yield ton/acre	Protein %	Consumptive Use (inches)
Irrigated Alfalfa	4.40	17.5	22
Non-irrigated Alfalfa	3.40	16.5	15
Tame Hay	1.91		

Irrigation in excess of that required to promote germination along the Peace River increased the cob length of sweet corn and decreased the number of days from seeding to harvest. In the Edmonton area, irrigation during late August and early September increased yield and quality of both carrots and parsnips and improved the mechanical digging of these crops.

ALBERTA WATER CONTROL PROGRAM

This program began in 1954 to provide technical as well as financial assistance to local governments. Counties, municipal districts, improvement districts (through the Department of Municipal Affairs), drainage districts, and irrigation districts may enter into cost-sharing agreements with the provincial government on an individual or joint basis.

In the past the primary objective of most projects was flood control. Now, however, more projects stress the multi-purpose use of water. In recent years Ducks Unlimited (Canada) has provided considerable financial contributions for multi-purpose projects.

Bigelow Dam Project

This is one of the larger Alberta Water Control projects constructed in 1971 and it typifies the multi-purpose concept being applied to water development. Bigelow Dam is located on Threehills Creek in southeastern Alberta near the Town of Trochu.

The dam consists of an earth embankment 35 feet high and 700 feet long with a concrete spillway located through the embankment. The reservoir created by the dam has a full supply capacity of 5,000 acre-feet and a flooded area of 520 acres. Since the reservoir is of sufficient depth to accommodate fish, the reservoir area was cleared of brush and trees as required for development as a fishery.

Benefits of the project are flow regulation in Threehills Creek; assured industrial and domestic water supply; recreation; and waterfowl preservation and propogation.

This project was financed by Ducks Unlimited, the Municipal District of Kneehill No. 48, and the provincial government, at a total cost of $395,000.

Red Deer River U-Tube Aerator

The Water Resources Division started construction of a U-tube aerator at a site on the Red Deer River about 18 river miles downstream of the city of Red Deer. This project, the first of its kind in Alberta, will attempt to maintain dissolved oxygen levels in the Red Deer River above the provincial minimum of 5 milligrams per litre during the critical winter months.

The project consists of an earthfill weir across the river, a diversion channel cut through bedrock on the left bank, and the aerator which is located in the diversion channel. The weir will raise the level of the river and divert 178 cubic feet per second into the bedrock channel. In the aerator the water will be mixed with 1600 cubic feet per minute of air supplied by a blower and then forced 39 feet below channel grade and back to the surface through the U-tube, constructed of corrugated steel pipe. The water is then returned to the river.

The function of the U-tube is to provide hydrostatic pressurization of the air-water mixture and thus improve the dissolved oxygen content. The rate of transfer of oxygen from air to water is three times as great as the bottom of the U-tube as at the surface.

As of December 31, 1971, the weir was complete (except for closure), the channel was complete, and the U-tube was in place.

Summary

The following table lists the projects initiated under the Alberta Water Control Program during 1971.

Project	Location	Percentage Completed 1971
1. Paddle River St. I	C No. 11 & No. 28	10
2. Pine Creek St. I	C No. 12	75
3. Dapp Lake	C No. 12	95
4. Red Deer River U-Tube Aerator	C No. 23	80
5. Waskasoo Creek St. II	C No. 23	100
6. Toad Creek St. I	C No. 28	100
7. Romeo Lake	C No. 28	100
8. Norris Creek	C No. 30	95
9. Bigelow Dam	M.D. No. 48	100
10. Ribstone Creek St. IV	M.D. No. 52	100
11. Ribstone Creek Dams	M.D. No. 52 & No. 61	60
12. Guenette Project	M.D. No. 130	100
13. Johnson Project	M.D. No. 130	100

14. Gosling Lake	I.D. No. 11	95
15. Talbot Project	I.D. No. 17	100
16. Mulligan Creek	I.D. No. 20	100
17. Keg River	I.D. No. 23	100
18. Rosenberger Project	I.D. No. 23	100
19. Grimshaw Flood Control	Town of Grimshaw	95
20. Sawridge Creek	Town of Slave Lake	95

IRRIGATION CAPITAL WORKS PROJECT

The Irrigation Capital Works Project was formally established by name in mid-January 1971. A task force committee consisting of the section heads of various branches participating in the program was established. The first major work of this committee was to prepare a general network diagram to show all of the required inputs and the order in which they were to be produced. Following this, a three day seminar was held to identify the activities for implementation purposes. At this seminar, a list and brief description of some 50 jobs was presented to the Planning Advisory Board for its approval of studies and allocation of resources.

The work of investigations, surveys, report writing and construction then proceeded. During the course of the year, some structure failures and additional requests from the districts increased the number of jobs from 50 to a total of 95. Every attempt was made to service the requirements of the irrigation districts and about two-thirds of the total year's requests were presented in report form. Most of these were advanced into the construction stage, with 28 jobs started and completed in 1971. There were 20 rehabilitation jobs on which construction was started in the fall of 1970 and which were completed in 1971. Twenty-five jobs which were started in 1971, but were not completed by the end of December 1971.

Five Year Rehabilitation Plans

In the fall of 1970, the Lethbridge Northern Irrigation District and the Bow River Irrigation District and later the St. Mary River Irrigation District, made application to the Irrigation Council for exemption from payment of seepage damage claims, under the provisions of the Irrigation Act, by filing a "preliminary ditch rehabilitation plan" with the council. In order to continue this exemption, it was necessary for them to file a further ditch rehabilitation plan with the Irrigation Council, before December 31, 1971. In this regard a Five Year Ditch Rehabilitation Plan was prepared through a joint effort between Water Resources and the respective irrigation districts, and completed before the required deadlines.

In order to plan ahead for work on the Irrigation Capital Works program, all of the irrigation districts were asked to file a list of proposed rehabilitation jobs that they felt would be needed during the next five years in order to maintain efficiently operating irrigation works. These lists were received from most of the irrigation districts, and have been compiled into year-by-year lists of jobs with a preliminary cost estimate, and will be used by the various branches of the Water Resources Division as guidelines in planning and carrying out their participation in the Irrigation Capital Works Program. It is not expected that the districts will be able to adhere strictly to these priorities, as unexpected washouts or failures of old structures do take place, so these lists will be subject to revision from time to time.

Use of Consulting Engineers

Again in 1971, in order to meet the requirements of the program, the consulting engineering firm of Underwood, McLellan and Associates Ltd. of Calgary was hired to carry out design and construction supervision of several specified structures in the Eastern Irrigation District.

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